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INVESTIGATION OF CHABAHAR BAY INUNDATION ASSOCIATED WITH TSUNAMI OF MAKRAN SUBDUCTION ZONE

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Introduction

As a result of the conflict of Eurasia and Arabian plate in northwest of Indian Ocean, Makran Subduction Zone (MSZ) has been formed in vicinity of southern coasts of Iran and Pakistan. The collected information achieved by historical events and regional seismicity shows that coseismic tsunamis in the MSZ have repeatedly happened in the past and their occurrence in future are probable [1]. Thus, the hazard of tsunami for coast of Iran in Oman Sea is relatively high. In this paper using a fully nonlinear Boussinesq model, probable tsunamis caused by MSZ earthquakes has been simulated and their effect and probable following run-up on Chabahar Bay's coasts, most important and populated region of Iranian coasts in Oman Sea, has been investigated.

Numerical Modeling

Like common scheme of tsunami modeling, our simulations consist of three main steps; generation, propagation and run-up of tsunami waves. The required resolution of bathymetry data for modeling generation and propagation of tsunami is on the order of 1 kilometer, while this value for accurate calculating of tsunami run-up should be about few tens of meters. Therefore, simulations are performed in two distinguish models, i.e. local and global model.

Global Model

Magnitude and location of the possible earthquakes of MSZ cannot be determined absolutely. So, different earthquakes having moment magnitude between 7 and 9 has been simulated. In global model, possible earthquake specifications and fault parameters are introduced as inputs and then initial free surface elevation is calculated using Okada's deformation model (Fig.1) [2].

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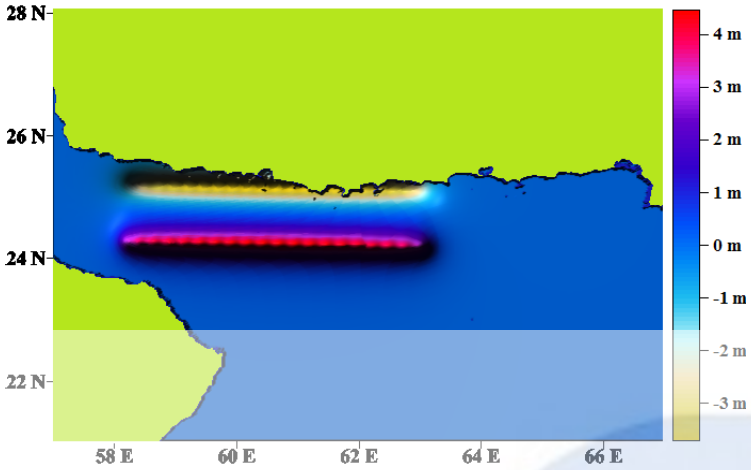

Fig. 1) Initial free surface elevation caused by earthquake in MSZ (Mw=8.6)

Calculated free surface elevation is transferred to fully nonlinear and dispersive Boussinesq equations as the initial conditions. Solving these equations, propagation of tsunami waves from source to adjacency of the intended coasts (Chabahar Bay) is simulated. As soon as waves reach to coasts and before of run-up beginning, global model is stopped and local model gets start.

Local Model

Local models area is much smaller than global model, while the resolution of its data is much higher than global model (about 90 meters). Using the "slot" method, run-up of tsunami waves on coasts is calculated and finally inundation maps are obtained (Fig.2) [3].

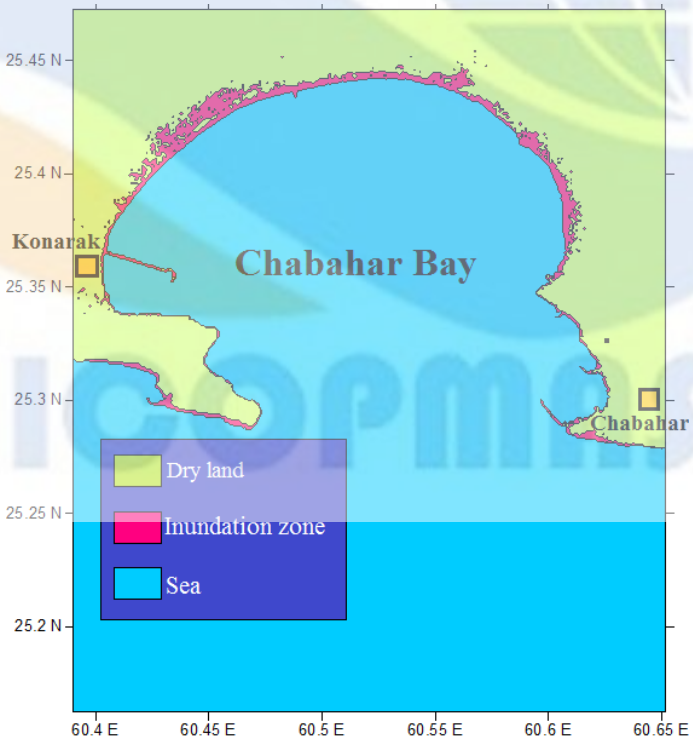

Fig. 2) Inundation of tsunami waves on Chabahar Bay caused by earthquake in MSZ (Mw=8.6)

Conclusion

Model results and inundation maps show that the two main ports of Chabahar Bay, Chabahar and Konarak Port, are safe against tsunami inundation if the moment magnitude of possible earthquakes would be lower than 8. In case of larger earthquakes only narrow parts of Chabahar

Port experience inundation, while inundation in Konarak Port is neglible again. This can be attributed to the high level of topography of the outer coasts of Chabahar Bay. As can see in Fig.2, inner coasts of bay have more inundation width, because of their relatively low level of topography.

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